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MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO) 10 September 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-219**
C.T. Liu (PRSM) et al., "Investigating the Effects of Pressure on the Near Tip Behavior and Crack Growth in a Particulate Composite Material" (viewgraphs only)

Int'l Conf on Damage & Fracture Mechanics 2002 **(Statement A)**
(Maui, HI, 15-17 October 2002) (Deadline: 11-Oct-02)

Investigating the Effects of Pressure on the near Tip Behavior and Crack Growth in a Particulate Composite Material

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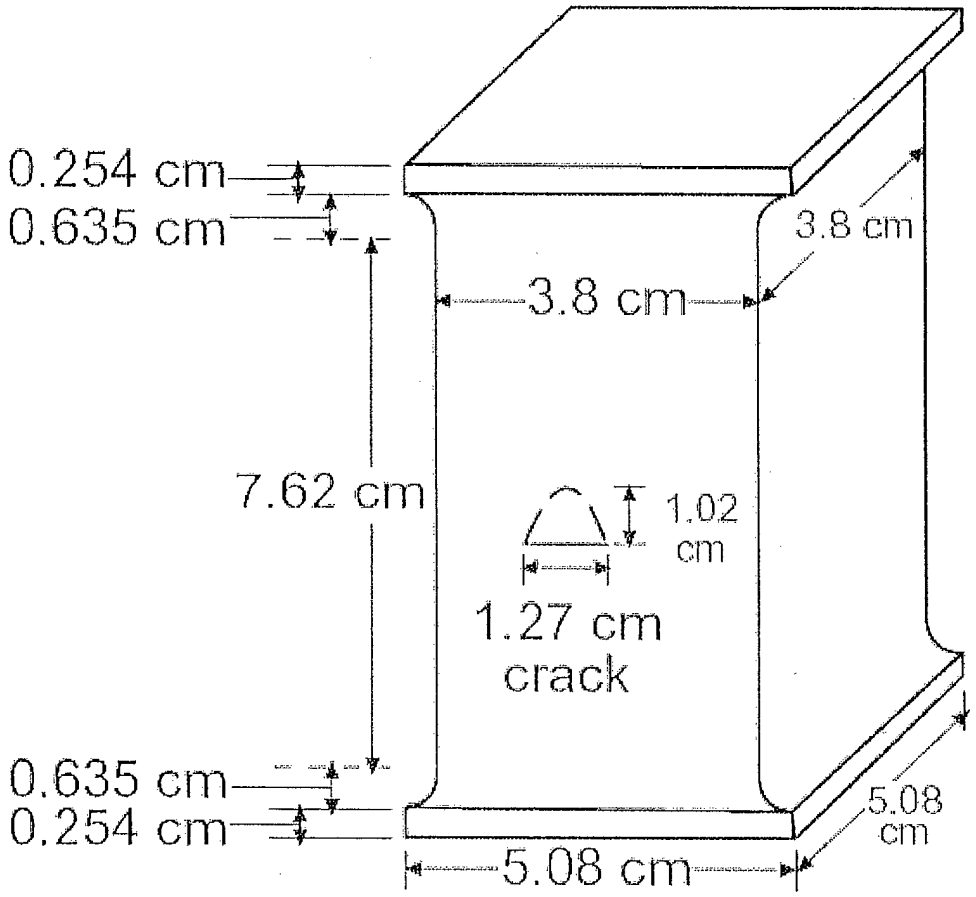
Objectives

- **Investigate the Effects of Confining Pressure and Loading History on the Near Tip Behavior and Crack Growth in a Particulate Composite Material.**

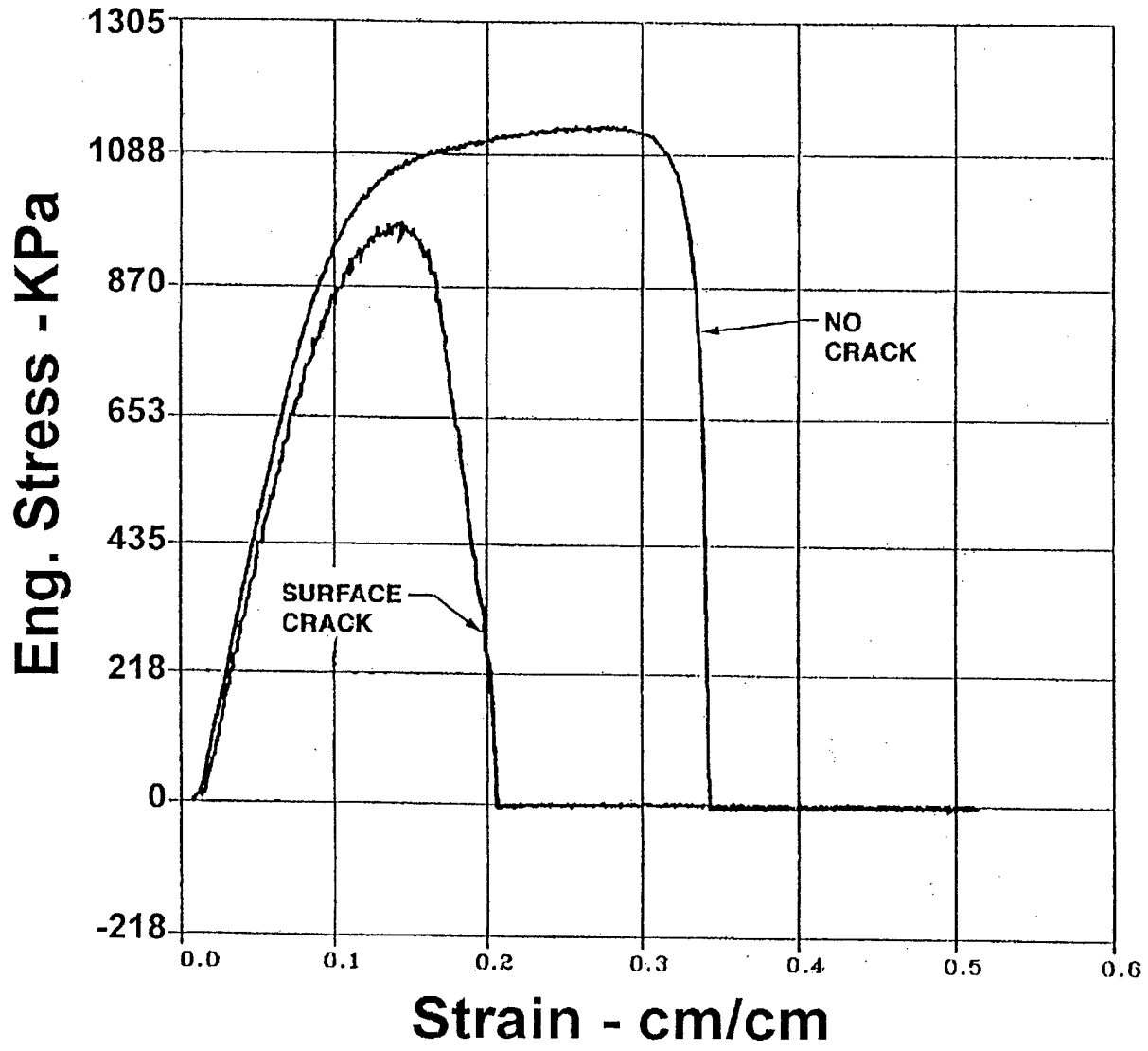
- **Confining Pressure:**
  - **Ambient and 8697 KPa**

- **Loading History:**
  - **Constant Strain Rate (5.8 cm/cm/min)**
  - **Constant Strain (18%)**

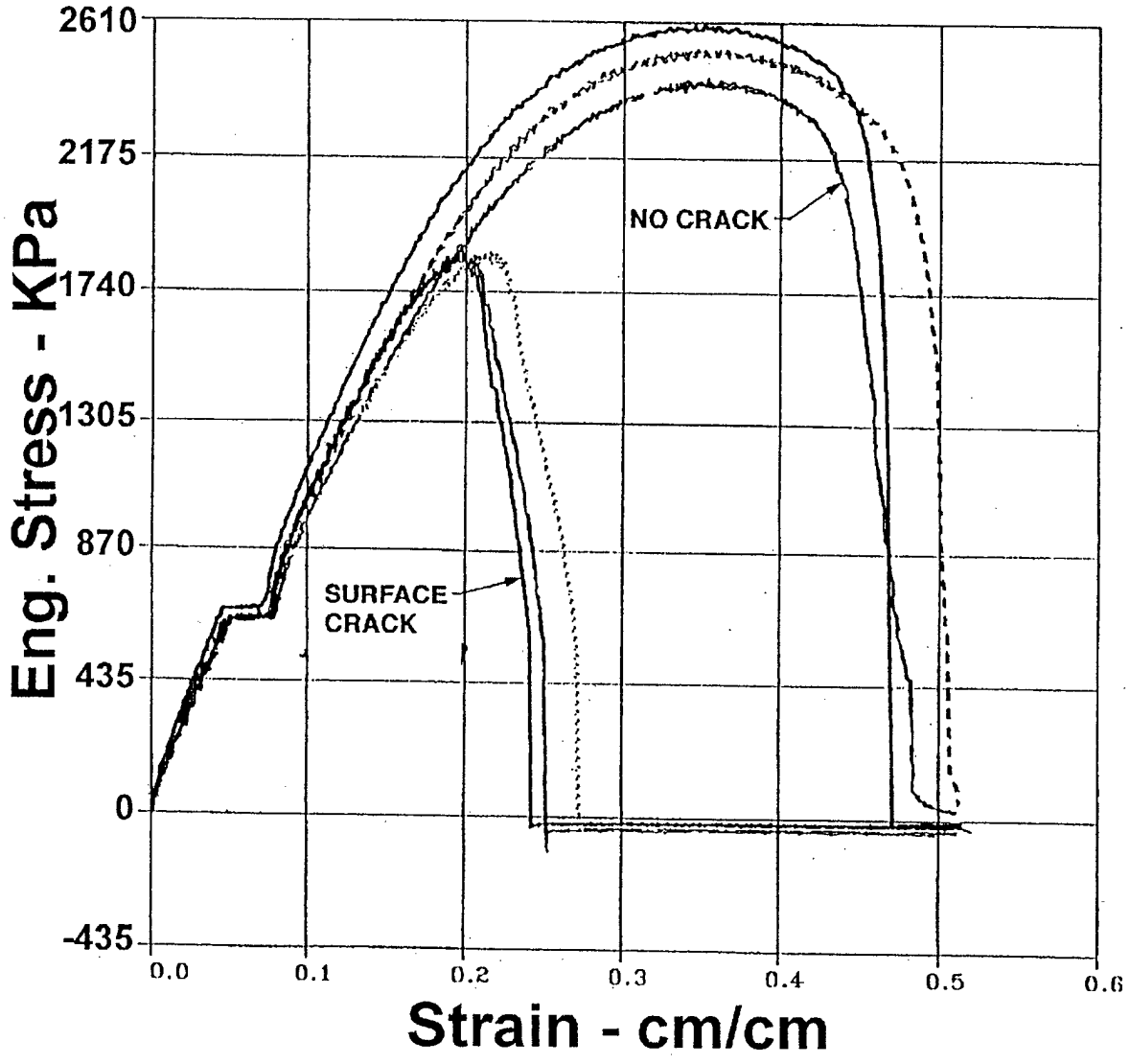
Specimen Geometry



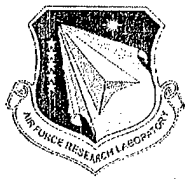
Engineering Stress Vs. Strain (Ambient Pressure)

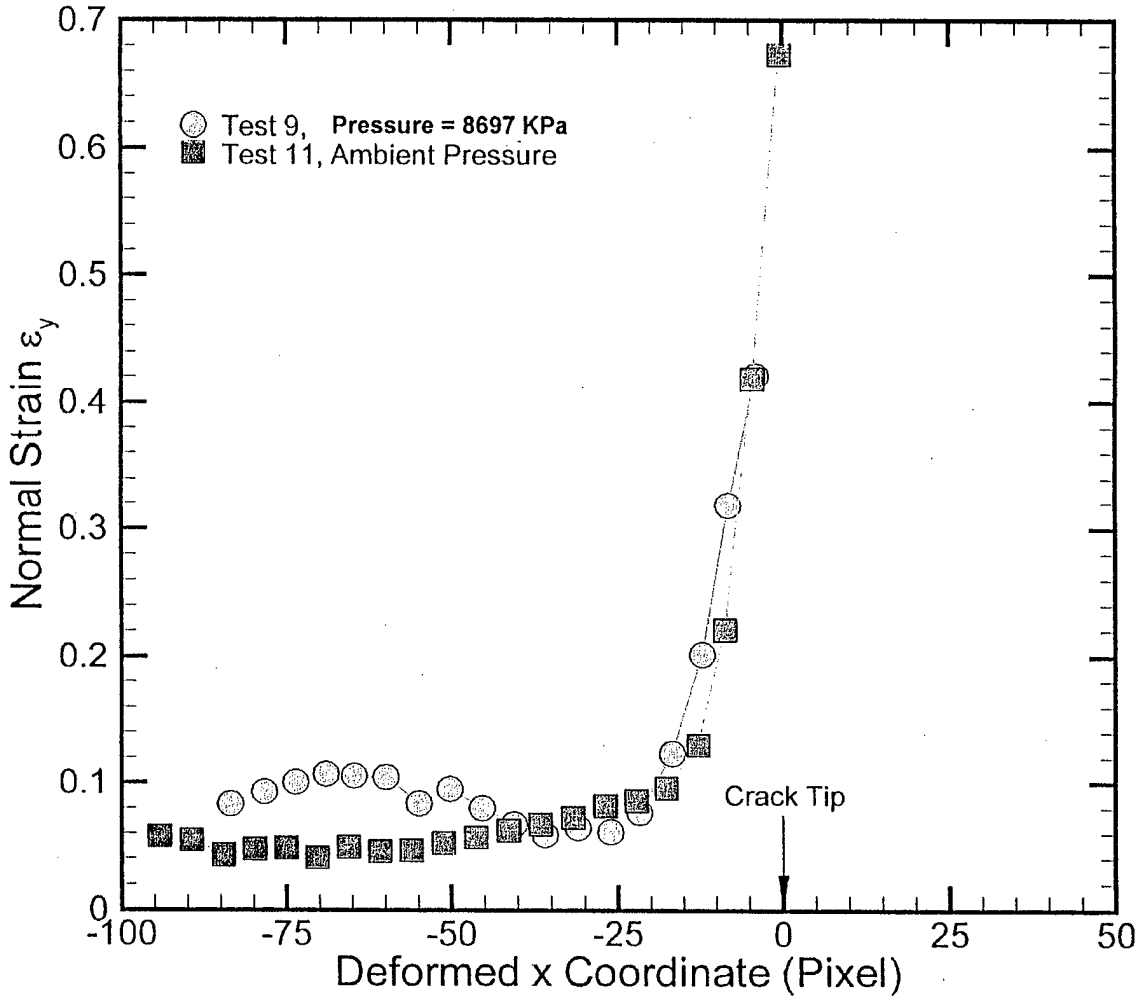


Engineering Stress Vs. Strain (8697 Kpa Presure)



Normal Strain Distribution Ahead of the Crack Tip at the Onset of Crack Growth





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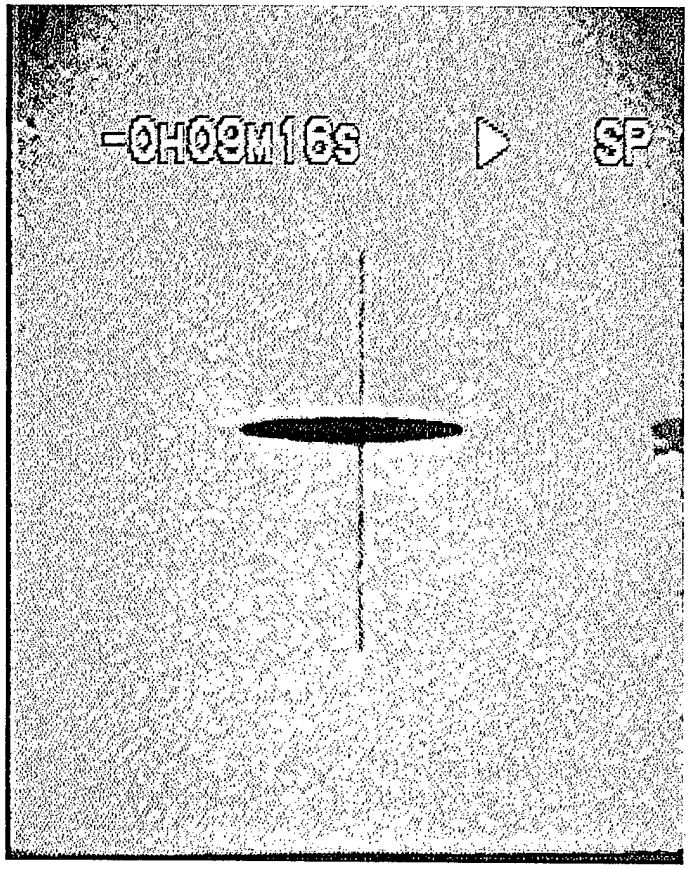
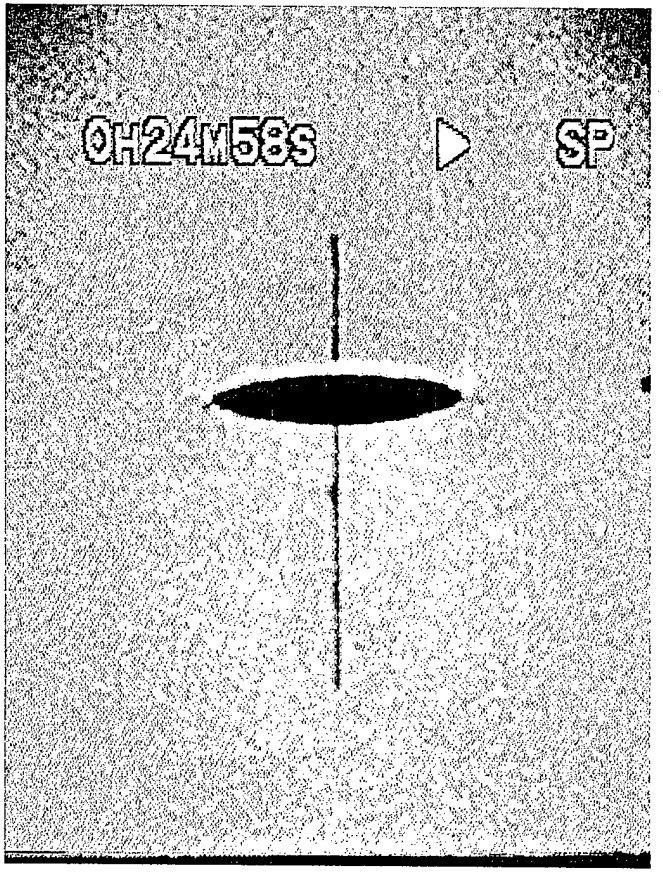
Crack Profiles at the Onset of Crack Growth

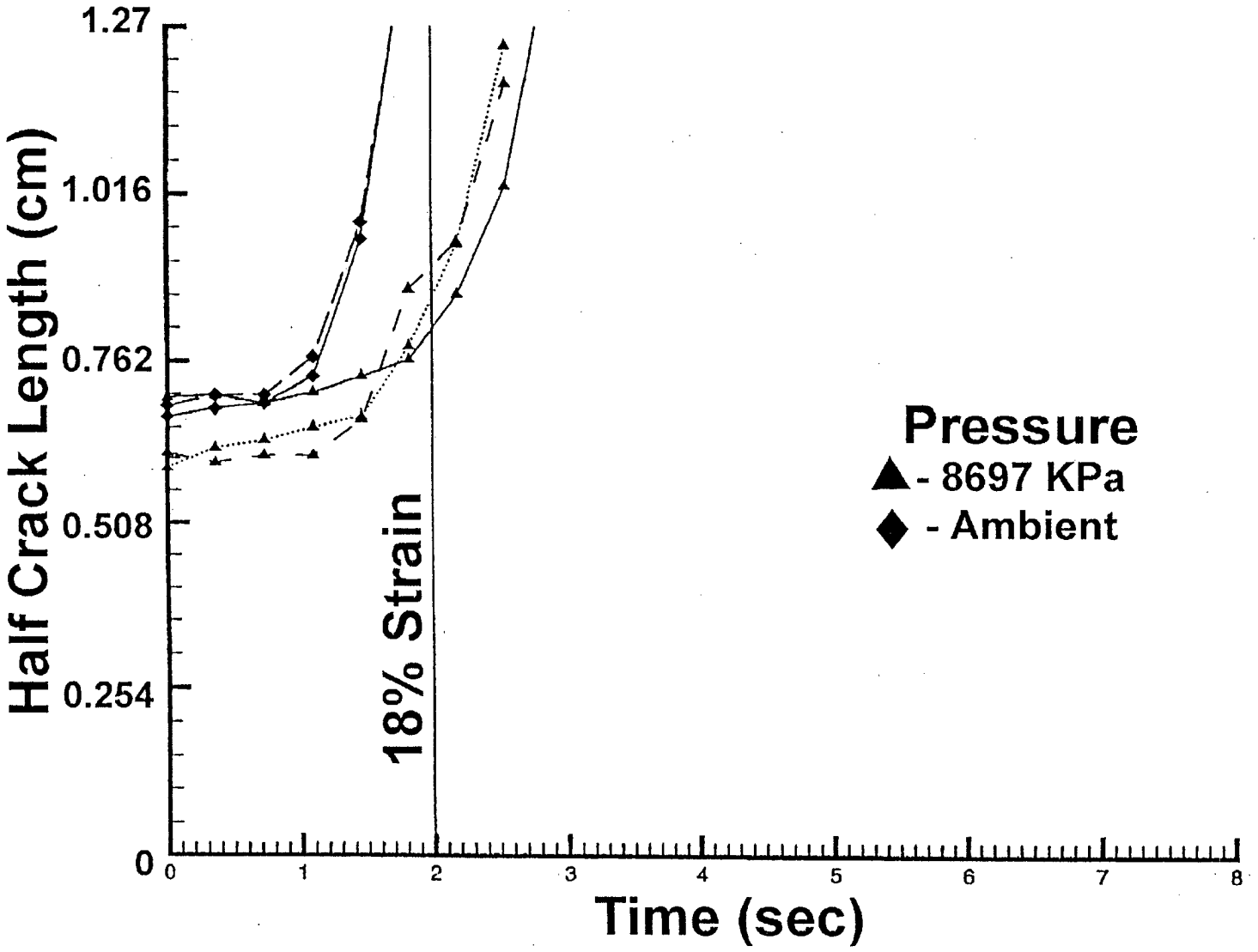


ambient pressure

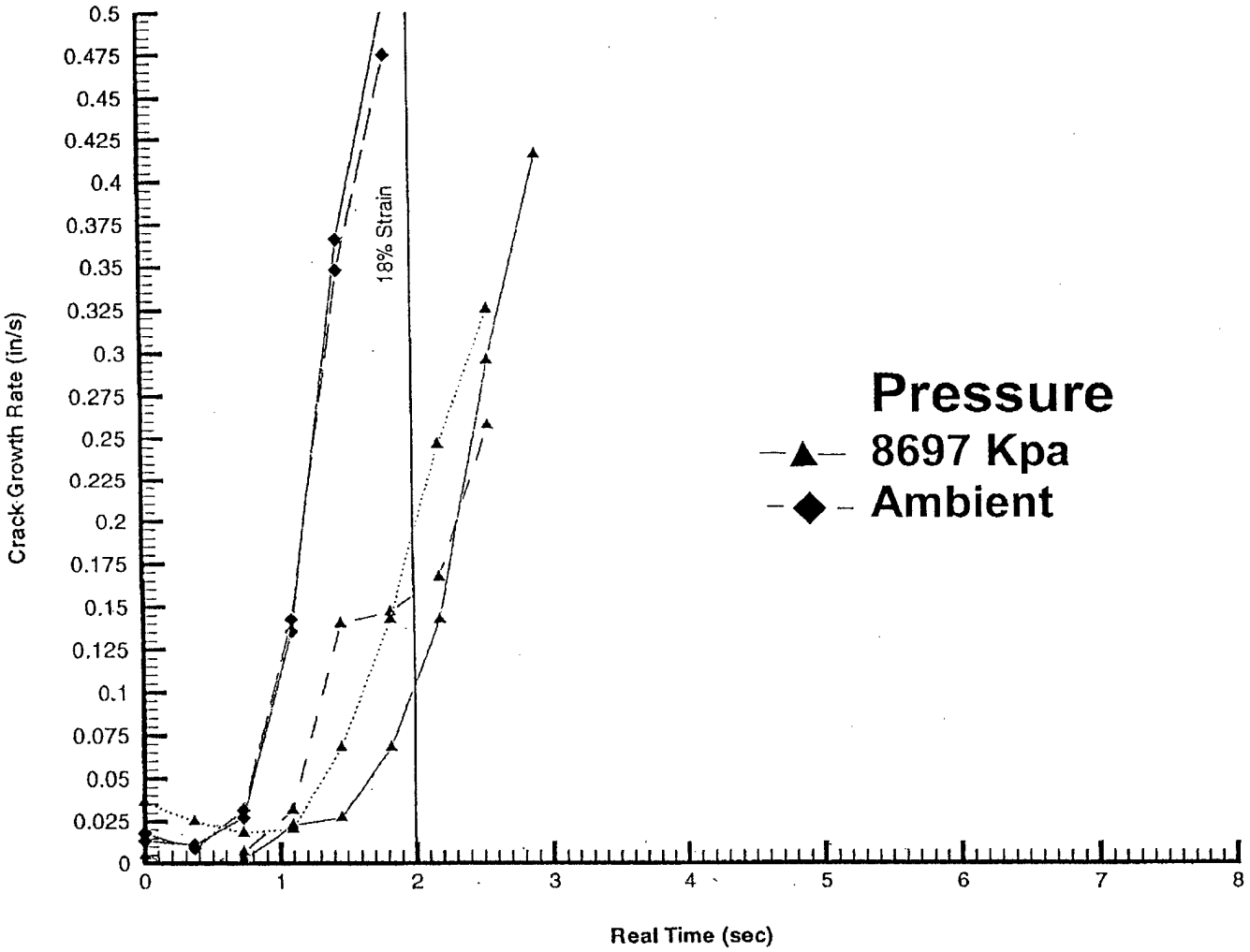


8697 Kpa confining pressure

Half Crack Length Vs. Time (Constant Strain Rate Condition)



Crack Growth Rate Vs. Time (Constant Strain Rate Condition)



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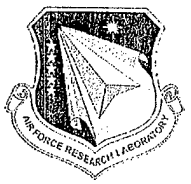
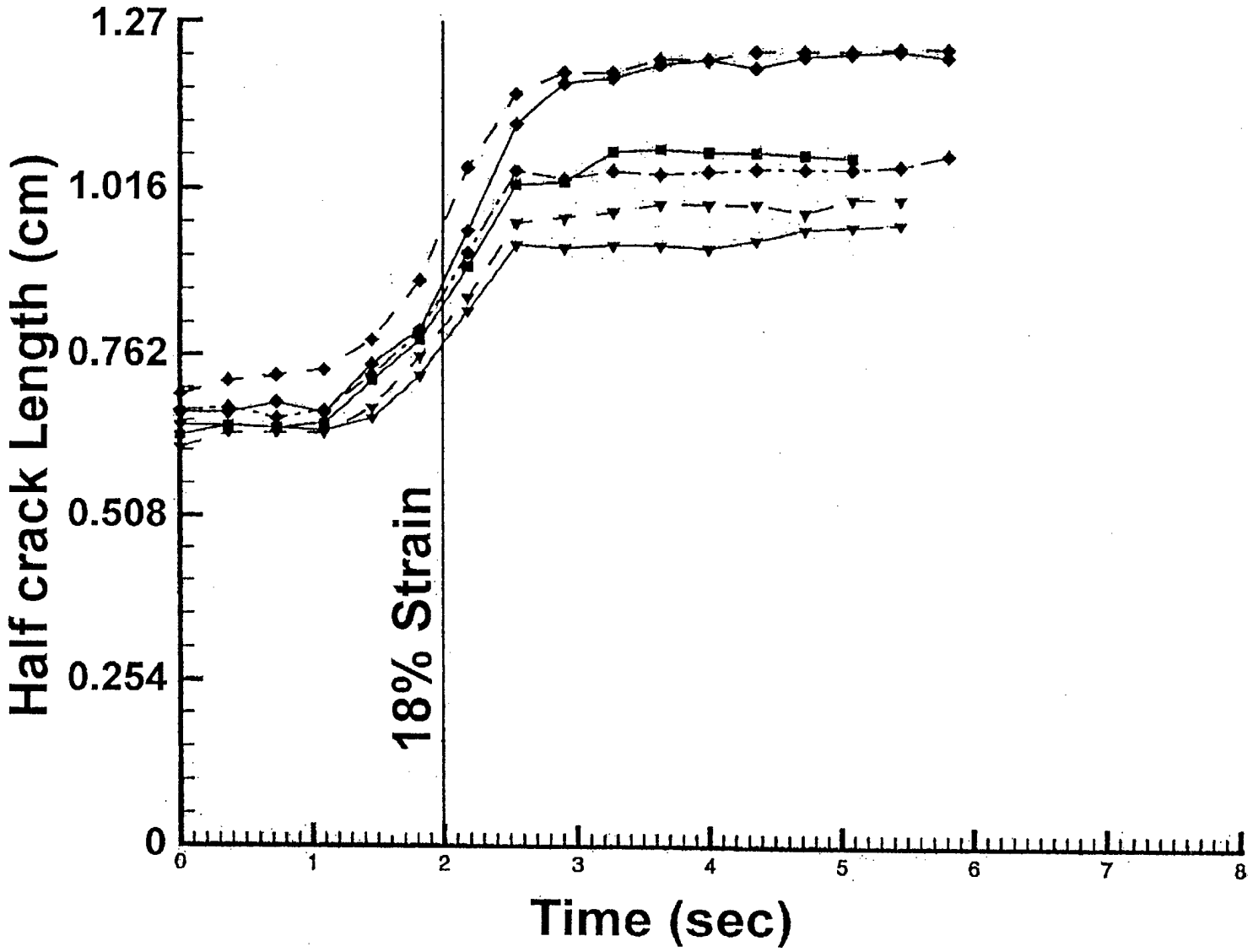
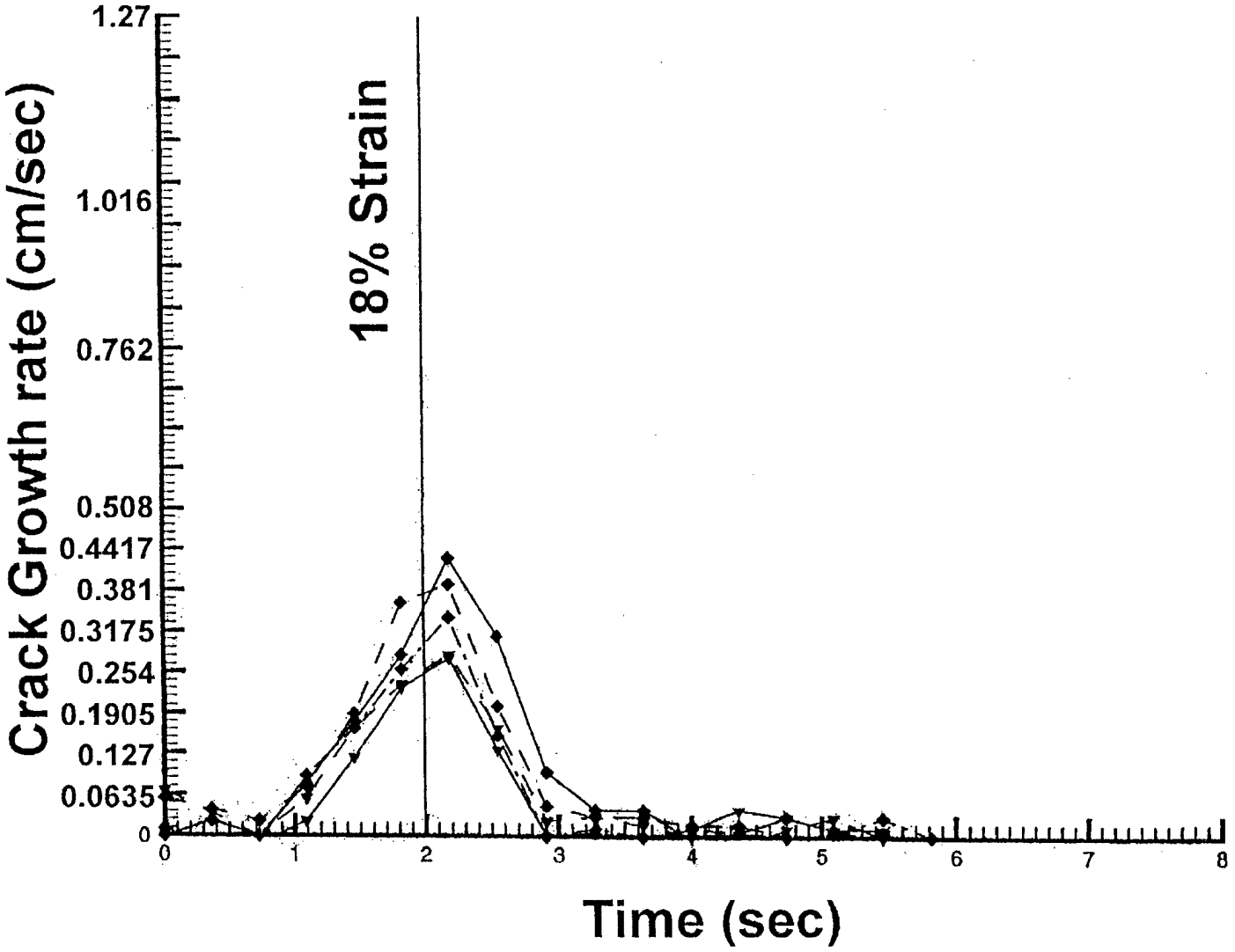




Crack Growth Rate Vs. Time (Constant Strain Condition)



Conclusions

- The crack growth rate under ambient pressure is significantly higher than that under 8697 KPa confining pressure.
- At the onset of crack growth, the crack opening displacement under 8697 KPA confining pressure is greater than that under ambient pressure.
- At the onset of crack growth, confining pressure has no significant effect on the size of the high-strain zone.
- Under constant strain condition, the crack stops growing after it propagates a short distance.